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BOTANY.

THE LAW OF EMBRYONIC DEVELOPMENT IN ANIMALS AND PLANTS. —An article upon this subject in the AMERICAN NATURALIST for May contains a hasty generalization, based upon pure assumption, or upon insufficient data, and supported only by a false analogy. It opens with the startling proposition that "it is a well known law in the animal kingdom, that the young or embryonic state of the higher orders of animals resemble (*sic*) the full-grown animals of the lower orders." If such a law had ever been discovered to exist, the tadpole and the caterpillar, which are cited in proof, would certainly be good illustrations of it. But this statement is so far from being "a well known law," or "one of the causes of the recent rapid progress in the study of the animal kingdom," that no eminent living naturalist or biologist recognizes the existence of such a law; or at least no one of them gives a hint of it in his writings.

Agassiz claimed that ancient animals resembled the embryos of recent animals of the same class, and that the geological succession of extinct forms is parallel with the embryological development of existing forms. But if this principle be true, it is far from meeting the requirements of the "law" of this article.

The writer of it may have had in his mind a vague idea of the law of Von Baer, which *is* well known, and which *has* enabled naturalists "to correct their systems of classification," viz.: "That, in its earliest stages, every organism has the greatest number of characters in common with all other organisms, *in their earliest stages.*" Or, to put it in language parallel to that of the "law" of this article, false syntax excepted; the embryonic state of the higher orders of animals resembles *the embryonic* (not the full grown) *state* of the lower orders. The germ of a human being differs in no visible respect from the germ of every animal and plant: it never resembles any full grown animal or plant. It successively looses its resemblance to vegetable embryos, then to all embryos but those of Vertebrates, then to all but those of Mammals. Finally it resembles only the embryos of its own order, Primates; and at birth the infant is like the infants of all human races.[1] But never at any period of its successive differentiations does it resemble the *adult form* of fish, reptile, bird, beast, or monkey.

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[1] See Spencer's Biology, Vol. I.

The principle stated is not a law of the animal kingdom. If it be a law at all, it is a newly discovered one, and applies only to the vegetable kingdom.

The proposition to be established then is, that the young or embryonic state of the higher orders of plants resembles the full grown plants of the lower orders. The writer finds his first proof in a comparison of the fovillæ of a pollen grain with full grown Desmidiæ. The points of resemblance are these: both are minute; each consists of a single cell; and both have an apparently aimless motion. Surely, these resemblances are not numerous or striking enough to found a law upon; and if they were, they have not the remotest bearing upon the supposed law. Admitting that the fovillæ "may be regarded as one of the first steps towards the reproduction of plants of the highest type," yet they are not in any sense a *young or embryonic form* of a plant. The fovillæ constitute the male element, and are homologous, not to the *embryo*, but to the *spermatozoa* of animals. The supposed analogy between a Protococcus and a pollen grain is open to the same criticism. Nor is the correspondence between a full grown Botrydium and a pollen tube of greater value. A pollen tube cannot, in any legitimate sense, be called embryonic. The superficial resemblance of a mould fungus to a stamen, is obvious enough; but in reality no analogy can exist between them. The spores of the mould are embryos, and will develop, under favorable circumstances, into mould again. But pollen grains are not embryos, and never, under any circumstances, grow into what, by any stretch of terms, can be called a new plant. Neither stamens nor pollen constitute a part of the embryo; and no analogy drawn from them can have any bearing upon the laws of embryonic development. If such a law as the writer claims really exist, it must be found by studying the development of the *ovule*, the true homologue of the animal embryo. In view of such facts, all "similar analogies" and all similar "proofs of the unity of design of the Creator" may be easily dispensed with.

The article proposes to extend the domain of a certain supposed law of the animal kingdom, so as to include the vegetable kingdom also. It has been shown, First, that no such law exists in the animal kingdom; Second, that not a single fact cited as proving it to be a law of the vegetable kingdom has the remotest bearing upon the question. If such hasty conclusions as these, wildly jumped at from no data, are to be allowed under the name of Science, her students will richly deserve all the ridicule and sarcasm which a certain class are so fond of pouring upon them.—CHAS. R. DRYER, *Phelps*, *Ontario County*, *N. Y.*, *May* 12, 1875.

COREOPSIS DISCOIDEA SPONTANEOUS IN CONNECTICUT. — Adjoining our cow-pasture is a piece of woodland of about four acres, with beech, birch, chestnut, oaks, etc., growing on it. It is level but has several depressions which form shallow ponds containing water most of the year. In one of these, about a hundred paces in circuit, grow button-bush, wild-rose sedges, cotton-grass, sphagnum, grasses, at least three species of Bidens or beggar-ticks and *Coreopsis discoidea.* I gathered flowers of the last when just coming into blossom, supposing it to be the common beggar-ticks, at the same time noticing its slender, delicate habit, so unlike the coarse weed of our fields. But, on examining the young ovaries, I could see no sign of the retrorse bristles on their awns, which the achenia of Bidens should have. I thought this might be owing to their immature state. Moreover, on comparing it with Coreopsis, I found it to agree with *C. discoidea* in everything except the *reflexed* outer involucre which an old edition of Prof. Gray's Botany assigned to it. I sent a bit of it to him and he pronounced it *C. discoidea.*

Just after this, I found, in the same place, a plant, very much like the former ones, which had unmistakably the achenia of *Bidens frondosa*, the ciliated outer involucral leaflets of the same, the flower heads just perceptibly larger than those of the Coreopsis, and the same delicate growth of the latter.

In the last edition of Prof. Gray's manual, he gives as one character of the subsection * * * * "scales of the outer involucre reflexed *or* spreading" without indicating to *which* of the four species the *reflexed* involucre belongs. I did not observe any such in the plants I gathered. The awns did not seem to me "*stout*" and they were merely hispid rather than "upwardly barbed."—CHARLES WRIGHT, *Wethersfield*, *Conn.*

FERTILIZATION OF ALPINE FLOWERS BY BUTTERFLIES.—In the ninth of a series of valuable papers communicated by Hermann Müller, to "Nature," on the fertilization of flowers by insects, he shows that butterflies effect the cross-fertilization of Alpine orchids. It seems that from twelve to fifteen per cent. of the orchids of the lowlands are fertilized by Lepidoptera, while from sixty to eighty per cent. of Alpine orchids are fertilized by the same kind of insects. This corroborates, he says, his view that the predominant frequency of butterflies in the Alpine region must have influenced the adaptation of Alpine flowers.

Müller has also shown the wonderful modifications brought about in the legs and mouth-parts of bees by their efforts in fertilizing flowers.

ZOOLOGY.

On the Development of the Nervous System in Limulus.[1] — After a good many unsuccessful attempts at discovering the first indications of the nervous system in the embryo of Limulus, I at length, in making fine sections, with the aid of the skill of Prof. T. D. Biscoe, discovered it in a transverse section of an embryo in an early stage of development, corresponding to that figured on plate iv, fig. 10, of my essay on the Development of *Limulus Polyphemus* in the Memoirs of the Boston Society of Natural History. The period at which it was first observable was posterior to the first blastodermic moult, and before the appearance of the rudiments of the limbs. The primitive band now surrounds the yolk, being much thicker on one side of the egg than on the other, the limbs budding out from this disk-like thickened portion which represents the outer or nervous layer of the germ. At the time the nervous cord was observed it was entirely differentiated from the nervous layer proper, and in section and relation to the nervous layer appeared much as in Kowalevsky's figure (33) of the germ of Hydrophilus (Embryologische Studien an Würmen und Arthropoden, 1871).

At a later stage in the embryo, represented by Pl. V, fig. 16 in my Memoir, at a period when the body is divided into a head and abdomen, and the limbs are longer than before, by a series of sections parallel with the under surface of the body, I could make out quite satisfactorily the general form of the main nervous cord. It then forms a broad thick mass, the two cords being united, with small holes between the cords opposite the sutures between the segments and situated between the primitive ganglionic centres.

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[1] Read at the November (1874) Meeting of the National Academy of Sciences.